TMDL Development for Dissolved Oxygen and Nutrients for Bayou Lafourche Subsegment (020401) in the Barataria Basin, Louisiana

Submitted to:

United States Environmental Protection Agency
Region 6

Prepared by:

The Cadmus Group, Inc.

ARCADIS G&M, Inc.

The Louis Berger Group, Inc.

March 17, 2005

Attachment A - Response to LDEQ Comments Regarding Draft TMDL Dated December 1, 2003

Contract No. 68-C-02-109
Task Order 2003-003

Attachment A

Response to LDEQ Comments Regarding Draft TMDL Dated December 1, 2003

- LDEQ Comment 1 - What happened to the DEQ position that modeling for DO also regulates nutrients? Isn't this statement used in some TMDL's? Why is this TMDL different? Shouldn't we ask EPA to be consistent in using the DO/nutrient correlation?

  Response: Our TMDL was developed based on the requirements of our scope of work and follows previously approved TMDLs in Louisiana that have been approved by EPA Region 6.

- LDEQ Comment 2 - Is one of the problems related to estuaries, the lack of nutrients (or reduction of nutrients they are receiving)? If so, why are we worried about nutrients in a water body flowing to the estuaries unless it is affecting DO?

  Response: Our TMDL was developed based on the requirements of our scope of work and follows previously approved TMDLs in Louisiana that have been approved by EPA Region 6.

- LDEQ Comment 3 - Since this TMDL recognizes the influence of the Miss R water on B Lafourche, shouldn't the TMDL reference the N:P ratio and the background N and P concentrations developed by DEQ (Mike Schurtz and Dugan) in the Dec, 1986, report, Evaluation and Projection of Water Quality Impacts from Nutrient Loading to the Miss R and Associated Estuaries? This report was presented to the Ad Hoc Gypsum Task Force. It seems we would want to maintain consistency, until the report is shown to be wrong.

  Response: The nitrogen:phosphorus ratio (10:1) utilized in the TMDL was obtained for the Upper Mississippi Alluvial Plain and South Central Plain ecoregions from the document Overview of the 1995 and 1996 Reference Streams by D. Smythe. The document reference by LDEQ is not readily available to the public and is not as recent. The N:P ratio utilized in the TMDL was evaluated by compiling nutrient data from the monitoring stations on the Bayou Lafourche subsegment. The data indicated that the N:P ratio utilized was appropriate.

- LDEQ Comment 4 - I haven't read the TMDL word-for-word, but I could not determine the WLA for point sources. It would be nice for the report to clearly state (1) the WLA for existing point sources with permits or what reductions (if any) are required for them, (2) what limits should be placed on existing point sources that currently do not have permits and (3) what limits should be given to new point sources. I assume the limits for new point sources must come out of the MOS. But, what about existing point sources? Are they currently considered with the non-point source loading? And, if so can we take their allocation from the non-point source LA? What limits should they get?

  Response: A table of WLAs for existing dischargers has been added to the TMDL report. Items (2) and (3) would be policy decisions that are not part of the contracted scope of work. Existing point sources that currently do not have permits should contact LDEQ for permits, and LDEQ may allocate the MOS to a new point source. Our TMDL was developed based on the requirements of our contracted scope of work and follows previously approved TMDLs in Louisiana that have been approved by EPA Region 6.

- LDEQ Comment 5 - I can understand the idea of trying not to be specific in the TMDL to allow the flexibility for permits to make reasonable decisions. However, in practice when the TMDL's haven't included specific permit conditions (limits), permits is often left with relying on region 6 'strategy' to make permit decisions - and their strategy is often conservative.

  Response: Allocations for future permits would be assumed to come from the MOS and would be assumed to require decisions by LDEQ based on existing permitting policy and procedures.

- LDEQ Comment 6 - I spoke with Max Forbes, our consulting hydrologist, about this, and he provided the following suggested method for determining a low flow that doesn't include the zero flow days when the pumps aren't working. He feels this approach is more appropriate than use of 7Q10 for waterways such as Lafourche that are subject to man's control through pumping. We utilized this approach for our Bayou Teche TMDL for this reason.

  1. Pull USGS data for the time period of interest; it can be separated into summer and winter seasons if necessary. Rank the data or plot it out using a percent (%) of time scale (%of time or number of times for each reported flow value). This will provide a scale ranging from the very high to the very low values.
  2. At the point where the scale "drops off" or levels out at the low end, you can take that value. It should be approximately a 20 percentile or 25 percentile value, where 80 to 75% of the values are higher. This 80%ile value can be utilized in lieu of 7Q10. This way you are not including the days when the pumps aren't running and flow may be 0. The 7Q10 calculated from the gauging station data would include those 0 values, producing a very low value that is not really reflective of the "average" low flow condition in the bayou

  Response: The summer critical flow used in the TMDL report come from Low-Flow on Streams in Louisiana (2000) by Lee and are based on historical flow data at the Thibodaux station for 1984 through 1997 comprised of 4,755 observations. These observations contained only twelve days where data points were not provided (not zero flow values). The twelve days in question were from the period of January 22, 1989 to Febraury 4, 1989, therefore the observations were not representative of summer critical conditions. The 7Q10 value was not determined from a week of observations containing a zero value or no observed value, therefore the 7Q10 flow utilized in the TMDL for summer season is appropriate. The 7Q10 for winter season was calculated utilizing a statistical probability analysis similar to the one suggested by LDEQ.

- LDEQ Comment 7 - The method used to calculate nutrient allocations will definitely produce numbers. Of course, if the waterbody is nitrogen limited, it does no good to reduce phosphorus to the naturally occuring ratio. The nutrient that would need to be reduced to improve water quality would, in this case, be nitrogen. But if we have to have numbers, this is a way to get them.

  Response: We agree with the LDEQ comment.

- LDEQ Comment 8 - Sections 3.6 & 3.17 - Temperature not simulated, incremental temperature set to zero. Temperature was input as an initial condition at 26.46-27.48 oC for the calibration and 30/20 oC for the summer/winter projections. Since temperature is not simulated, the model is run at the specified initial temperatures. The temperature of incremental and point source inputs to the bayou is not read by the model.

  Response: We agree with the LDEQ comment and the current version of the TMDL reflects this comment.

- LDEQ Comment 9 - Based on the in-situ samples taken during the September 2003 survey, Bayou Lafourche meets the dissolved oxygen criteria of 5 mg/l.

  Response: We concur. Since September 2001, there have been no DO values observed by the water quality monitoring station at Thibodaux that were below the 5.0 mg/L standard.

- LDEQ Comment 10 - It really would be a good idea if the contractor would forward the calibration to us if they decide to recalibrate. The input dataset would suffice.

  Response: It is assumed that EPA will make the calibration file for the TMDL available to LDEQ as that is part of the TMDL report.

- LDEQ Comment 11 - The survey covered Bayou Lafourche from Donaldsonville to Larose with just three sampling sites, one at LDEQ Site LA0023 near Donaldsonville, one at LDEQ Site LA0293 at Thibodaux, and one at LDEQ Site LA0111 at Larose. The number of sites is just barely acceptable - LDEQ would probably have sampled six sites, three above and three below the Thibodaux weir.

  Response: We agree with LDEQ that the sampling of three sites is acceptable for the purposes of this TMDL and that more sites would be preferred.

- LDEQ Comment 12 - The nutrient algae cycle was modeled, based on a finding that there is an algae problem in Bayou Lafourche. The model was calibrated to *Chlorophyll a* data as follows:

Donaldsonville	5.5
Thibodaux	5.0
Larose	13.0

  Settled algae was converted to SOD, giving the model such a high oxygen demanding load that, in order to calibrate to measured dissolved oxygen, CBOD and ammonia decay rates were set very low, and organic nitrogen was not decayed at all. In addition, there is no nonpoint loading or benthic production of ammonia in the model.

  Unfortunately, the data cited above were the raw *chlorophyll a* data and include *pheophytin*. The corrected *chlorophyll a* data, which should be used, as reported by the Iowa University Laboratory are:

Donaldsonville	<1, <1
Thibodaux	<1
Larose	7, 3, <1

  These data indicate that there is little algal activity in Bayou Lafourche. It is suggested that the model be recalibrated without the nutrient-algae cycle. It may not even be necessary to put the *chlorophyll a* found at the Larose site in the initial conditions, and apply the default "Algae Oxygen Production" of 0.05 mg O2/ug *chlorophyll a*/day.

  Response: We have recalibrated the model utilizing the corrected chlorophyll a data as indicated by LDEQ.

- LDEQ Comment 13 - There was no continuous monitoring of DO or day/night sampling, and thus no evidence of the diurnal DO cycle that would be expected if algae was a problem at the time of the survey. We can't tell from the DO data collected if the model was calibrated to an appropriate dissolved oxygen, or if the DO data was just a random sampling of a diurnal DO cycle. Without such data, however, it must be assumed from the low corrected *chlorophyll a* results that there is no diurnal cycle and the in-situ DOs are representative of the bayou.

  Response: As stated above by LDEQ, the corrected chlorophyll a data do not indicate that there is significant algal activity in the subsegment. Diurnal DO was not measured during the intensive stream survey, but the fluctuation in DO would be expected to be minimal. We believe the in-situ DO values are representative of the subsegment.

- LDEQ Comment 14 - Section 3.13 - reaeration

The reaeration coefficient of 0.6/day was based on a LDEQ study between Napoleonville and Labadieville, above the Thibodaux weir. This is good for the upper non-tidal reach but may not be appropriate for the lower, tidal, reach.

LAQUAL is capable of simulating tidal velocities by a tidal prism calculation in a situation such as this, and uses a composite of tidal and adjective velocity to calculate reaeration from a number of different relations. Data is also available to adjust reaeration for wind effects, and in the lower portion of Lafourche this is probably also significant. It is possible that reaeration was underestimated in the lower portion of Bayou Lafourche where the minimum summer season DO occurred.

Response: We believe the reaeration coefficient of 0.6/day is appropriate for the subsegment modeled. We have included tidal dispersion in this TMDL that should account for increased aeration in the lower boundary due to higher DO water dispersing through the lower subsegment at a faster rate.

- LDEQ Comment 15 - Concerning critical temperatures for projection, there are 5 LDEQ stations on Lafourche with enough data to estimate a 90 percentile temperature. The defaults are probably very close to the 90 percentiles, but an actual critical temperature should be calculated.

  Response: We agree with LDEQ and have utilized 90th percentile temperatures to develop this TMDL.

- LDEQ Comment 16 - Twenty day suppressed BODs were run and used as ultimate CBOD. If a CBOD decay rate of 0.08 is assumed, these CBODs would be about 20% lower than the ultimate CBOD. A conservative adjustment such as this would be justified. Before adopting the "proposed" method for CBOD (described in Standard Methods), LDEQ ran a suppressed 20 day BOD series and calculated an ultimate CBOD assuming a first order decay.

  Response: We agree with LDEQ.

- LDEQ Comment 17 - We could find no explanation of "reported" flow for point sources that is used in the calibration. What was the source of these figures? Permit applications in EDMS? It is preferred that these be a measured flow, or in the absence of a measurement, a design flow based on the design figures in the State Sanitary Code.

  Are the "permitted" flows that are used in the projections the flow categories for facilities with general permits? It is preferred that these be a design flow based on the design figures in the State Sanitary Code.

  Response: The reported flow values were from the permittees based on information provided in permit applications reviewed in the EDMS system.

- LDEQ Comment 18 - Sections 3.10 & 3.11 - Manning coefficient of 0.021 and dispersion not simulated.

  Downstream of the Thibodaux weir, Bayou Lafourche is tidally affected, and tidal dispersion was not simulated. The Manning coefficient does translate to a very small adjective dispersion, but tidal dispersion is neglected.

  Since there is presently no data for tidal dispersion in Louisiana's coastal estuaries, the contractor could not simulate tidal dispersion with LAQUAL. There is, however, sufficient tidal data to allow a non-steady state model, such as DYNHYD/WASP to simulate the dispersive effect of the tides.

However, there are no large point sources to disperse, so this omission of dispersion would only be a problem at the lower boundary if that boundary was, for example, at a windswept lake where dissolved oxygen levels would be expected to be high. Dissolved oxygen at the boundary at Larose would probably not be higher or lower than upstream reaches, so the absence of tidal dispersion probably did not affect the result.

Response: We agree with LDEQ that the previous absence of tidal dispersion probably did not significantly affect the previous result. However, we did calculate tidal dispersion utilizing the equation $E = aD^bQ^cV_T^d$*, using a tidal dispersion factor (a) of 800 square meters per second.*

- LDEQ Comment 19 - The lower boundary dissolved oxygen was set at 90% of DO saturation for the projections. There is no reason to believe that the lower boundary dissolved oxygen at Larose would be any higher or lower than the projected DO at Larose. If tidal dispersion is not being simulated, there is no reason to set lower boundary conditions or use an “”Ocean Exchange Ratio” other than zero.

  Response: We agree with LDEQ's comment and have revised the model to incorporate tidal dispersion.

- LDEQ Comment 20 - The contractor interpreted the standard levels of treatment in the LTP as written, but not as intended. A secondary discharge from a small treatment plant is represented as 30 $CBOD_5$, 15 NH_3-N, 7.5 Org-N, instead of 30/10/5. Since the discharges are small, and the same numbers were used for calibration and projection, this assumption is probably not causing a problem. This problem has been corrected in the latest version of the LTP.

  Response: We have revised the input parameters to reflect these assumed treatment levels.

- LDEQ Comment 20 - It would be helpful if the contractor would list the point source wasteload allocations.

  Response: The revised TMDL provides the WLAs in a table in the report.

- LDEQ Comment 21 - A brief scan of the report shows insufficient documentation and numerous minor errors.

  *Response: We stand ready to address specific comments***.**